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NATIONAL DAM SAFETY PROGRAM. DRY RUN NUMBER 102. INVENTORY NUMB--ETC(U)
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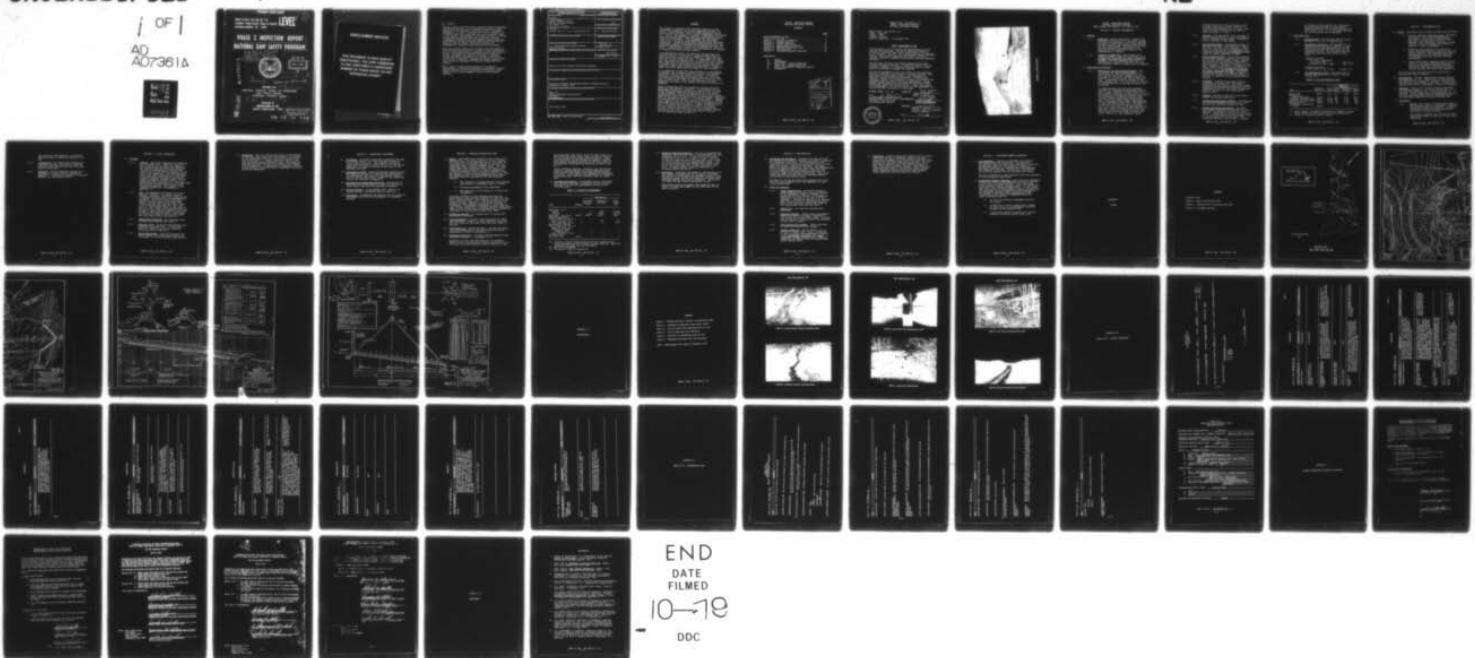
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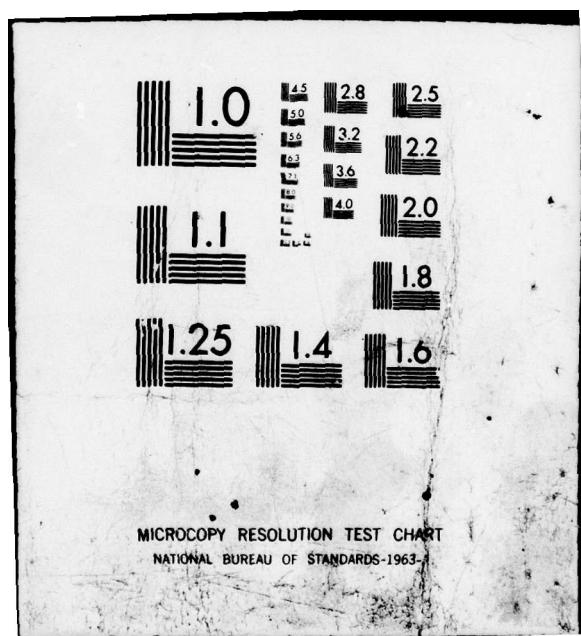
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POTOMAC RIVER BASIN

Name of Dam: Dry Run No. 102

Location: Page County, State of Virginia

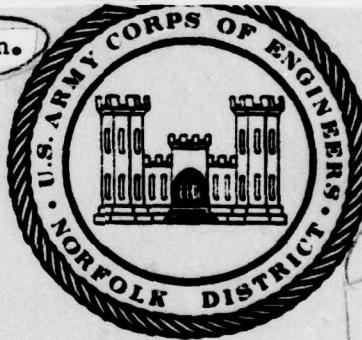
Inventory Number: VA 13901

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Dry Run Number 102. Inventory Number:
VA-13901. Page County, State of
Virginia. Phase I Inspection Report.

Potomac River Basin.



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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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NAME OF DAM: DRY RUN NO. 102

NAME OF DAM: DRY RUN NO. 102
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Dry Run No. 102
State: Virginia
County: Page
Stream: Dry Run
Date of Inspection: 15 November 1978

BRIEF ASSESSMENT OF DAM

Dry Run Dam No. 102 is an earth dam approximately 81 feet high and 830 feet long. The dam is privately owned by E. Miller and Austin Judd, and is maintained by the Town of Luray, Virginia. The U.S. Soil Conservation Service designed the dam. The visual inspection and review of as-built drawings indicate no serious deficiencies requiring emergency attention.

The spillway will pass the Probable Maximum Flood (PMF) without overtopping the dam. A stability analysis was not available; however, no evidence of distress due to slope-stability problems or seepage was observed.

Filling and reseeding of the tire tracks on the embankment should be completed without delay to prevent erosion. Also, some means of restricting access to the embankment by vehicular traffic should be considered. If restricting vehicular traffic is not possible, a means of protecting the embankment against erosion should be implemented. Recommended remedial measures to be scheduled during the annual maintenance inspection program are to: repair bare areas on the embankment, cut all tree growth on the embankment and rock toe drains, and install a staff gage.

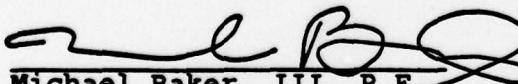
MICHAEL BAKER, JR., INC.

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Zane M. Goodwin
Original signed by
Chief, Engineering


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Chairman of the Board and
Chief Executive Officer

RECOMMENDED:

APPROVED: Douglas L. Haller

Douglas L. Haller
Colonel, Corps of Engineers
District Engineer

Date: FEB 14 1979



NAME OF DAM: DRY RUN NO. 102

OVERALL VIEW OF DAM



PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: DRY RUN NO. 102 ID# VA 13901

SECTION 1 - PROJECT INFORMATION

1.1 General

1.1.1 Authority: Public Law 92-367, 8 August 1972 authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams. The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

1.2.1 Description of Dam and Appurtenances: Dry Run Dam No. 102 (Morning Star Lake) is a zoned earthfill dam, approximately 81 feet high and 830 feet long. Seepage control is provided by a cutoff trench and an impervious core. An abutment drain is located in the left abutment area. A 10 foot berm is located at the upstream toe of the dam at normal pool elevation.

The approximately 200 foot wide emergency spillway is a vegetated side-channel spillway with a crest elevation of 1440.0 feet M.S.L. The principal spillway is a drop-inlet structure consisting of a reinforced concrete riser, a 36 inch diameter reinforced concrete water pipe with a 4.4 percent slope discharging into a riprapped stilling basin approximately 60 foot long and 25 foot wide. The reservoir is used for flood control and is provided with a low flow inlet in the upstream side of the riser (invert elevation 1409.5 feet M.S.L.). High flow inlets are located on either side of the riser and have a crest elevation of 1428.1 feet M.S.L. The reservoir can be

NAME OF DAM: DRY RUN NO. 102

drained using the 36 inch slide gate, with an invert elevation of 1388.6 feet M.S.L., located on the upstream side of riser. The plan and typical sections of the dam are shown on Plates 1, 2 and 3.

1.2.2 Location: Dry Run Dam No. 102 is located on Dry Run approximately 7.0 miles southeast of Luray, Virginia in Page County. A Location Plan is included in this report.

1.2.3 Size Classification: The maximum height of the dam is 81 feet. The reservoir volume to the top of the dam is 497 acre-feet. Therefore, the dam is in the "intermediate" size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

1.2.4 Hazard Classification: Due to the proximity of the Town of Luray, Virginia with a population of 3800 and the homes located along Dry Run between the dam and Luray, many lives could be lost in the event of failure of the dam. Therefore, the dam is considered in the "high" hazard classification as defined by Section 2.1.2 of the Recommended Guidelines for Safety Inspection of Dams. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or the probability of failure.

1.2.5 Ownership: The dam is privately owned by E. Miller and Austin Judd. The dam is maintained by the Town of Luray, Page County, Virginia with maintenance assistance from the Shenandoah Valley Soil and Water Conservation district and the U.S. Soil Conservation Service (SCS).

1.2.6 Purpose: The dam is used for flood control within the Potomac River Basin.

1.2.7 Design and Construction History: The existing facility was designed for the owner by the SCS and built by Wiley Jackson in 1969.

1.2.8 Normal Operational Procedures: No formal operational procedures are followed for this dam since its purpose is solely for flood control. Normal pool elevation of 1409.5 feet M.S.L. is maintained by an orifice-type inlet on the upstream face of the riser. The principal spillway (riser crest) is located

NAME OF DAM: DRY RUN NO. 102

at elevation 1428.1 feet M.S.L. with excess flows diverted through the side-channel emergency spillway with a crest elevation of 1440.0 feet M.S.L. It is not known how often the 36 inch slide gate is operated.

1.3 Pertinent Data

1.3.1 Drainage Area: The drainage area of the Dry Run Dam No. 102 is 2.08 square miles.

1.3.2 Discharge at Dam Site: The maximum flow at the dam site is not known. However, a land-owner who lives just downstream of the dam stated that he had never seen water in the emergency spillway. He did report that the water level has been over the top of the riser.

Principal Spillway:

Pool level at emergency	
spillway crest	218 c.f.s.
Pool level at top of dam . . .	232 c.f.s.

Emergency Spillway:

Pool level at top of dam . . . 15,400 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet M.S.L.	Area acres	Reservoir Capacity		
			Acre- feet(a)	Watershed inches	Length feet
Top of dam	1448.7	19.6	497	4.48	1300
Maximum pool, design surcharge	1443.0	17.9	401	3.61	1200
Emergency spillway crest	1440.0	16.60	340	3.06	1100
Principal spillway crest	1428.1	12.30	174	1.57	900
Normal pool (b)	1409.5	5.65	25	0.23	600
Streambed at centerline of dam	1368.0	-	-	-	-

(a) Total storage, includes 25 acre-feet of sediment storage below normal pool and 38 acre-feet above normal pool.

(b) Invert of low-level intake to riser.

NAME OF DAM: DRY RUN NO. 102

SECTION 2 - ENGINEERING DATA

2.1 Design: The design data reviewed included the following:

- 1) As-built drawings indicating plans, elevations and sections of the dam and appurtenant structures. Logs of test borings and test pits were also included in the as-built drawings. Plan and typical sections as taken from the as-built drawings are included as Plates 1, 2 and 3 in Appendix I.
- 2) Hydrologic and hydraulic data including outlet discharge capacity, reservoir area and storage capacity, and hydrograph and routing determinations for the principal spillway, the emergency spillway, and the freeboard hydrographs.
- 3) Annual maintenance inspection reports of the previous five years conducted by the Town of Luray with assistance from the Shenandoah Valley Soil and Water Conservation District and the regional SCS office (see Appendix V).

All existing data has been filed with the Norfolk District for future reference.

2.2 Construction: The dam, constructed by Wiley Jackson, was completed in 1969. Construction records were not available for this inspection, however, as-built plans were reviewed and verified in the field. Construction records are on file in Washington, District of Columbia.

2.3 Operation: There are no formal operating procedures for this dam because it is a flood control dam. It is not known how regularly the 36 inch slide gate is operated. Annual inspections are performed by the Town of Luray with assistance from the Shenandoah Valley Soil and Water Conservation District and the SCS.

2.4 Evaluation

2.4.1 Design: The as-built drawings were adequate for a general stability assessment. Stability calculations were not available. A study of the boring records and field observations indicates no evident problems.

The as-built drawings were verified by field measurements taken at the time of the visual inspection.

NAME OF DAM: DRY RUN NO. 102

The hydrologic and hydraulic calculations were sufficient to assess the design of the dam.

2.4.2 Construction: No construction records were available, however, the as-built drawings indicate minor modifications that were made during construction.

2.4.3 Operation: Annual inspection reports were available for review and are included in Appendix V. Operation of the dam is considered adequate for the purpose served.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

3.1.1 General: The field inspection was conducted on 15 November 1978. There was light to heavy rain during and after the inspection. The reservoir was at normal pool elevation. The dam and appurtenance structures were found to be in good overall condition at the time of the inspection. The problems noted during the visual inspection are considered to be relatively minor and do not require immediate remedial treatment except for the erosion started by vehicle traffic on the downstream slope (see Photo 1). The significant deficiencies are described briefly in the following paragraphs. The complete visual inspection check list is presented in Appendix III.

3.1.2 Dam: The embankment was generally in good physical condition. No cracks, unusual movement, sloughing, excessively deep erosion or seepage was observed on the embankment or abutments. There are several bare areas namely: vehicle tracks on the downstream slope of the dam and spillway slope, a path on the upstream slope near the riser (see Photo 2), and roadway tracks at the crest on the left side. There are scattered dried out patches of grass and wood debris in the lower 20 feet of the upstream slope. Small trees and brush have grown in the rock toe drain and rock slope gutters (see Photo 5).

3.1.3 Appurtenant Structures: No structural deficiencies were observed (see Photo 3).

3.1.4 Reservoir Area: No serious deficiencies were observed in the reservoir. A staff gage should be installed to monitor reservoir elevations above normal pool.

3.1.5 Downstream Channel: The stilling basin and outlet channel are functioning properly and the riprap is in good condition (see Photo 4).

NAME OF DAM: DRY RUN NO. 102

3.2 **Evaluation:** The only serious deficiency is the erosion in the tire tracks resulting from operation of vehicles on the downstream slope on the left side of the outlet works (see Photo 1). Topsoil should be placed in the bare areas and planted with grass seed. The access for vehicles should be blocked-off to prevent this problem from re-occurring. If restriction of vehicular traffic is not possible, then some means of embankment protection should be implemented.

NAME OF DAM: DRY RUN NO. 102

SECTION 4 - OPERATIONAL PROCEDURES

- 4.1 Procedures: No formal operational procedures are used for Dry Run Dam No. 102, since the dam is used as a flood control structure. The reservoir remains at normal pool elevation of 1409.5 feet M.S.L. and has an additional 30.5 feet of storage to the crest of the emergency spillway.
- 4.2 Maintenance of Dam: Annual maintenance inspections are performed by the Town of Luray with the assistance of the Shenandoah Valley Soil and Conservation District and the regional SCS office. Copies of the inspection reports are included in Appendix V.
- 4.3 Maintenance of Operating Facilities: The dam has no operating facilities since it is used exclusively for flood control and flow from the dam is automatic.
- 4.4 Warning Systems: At the present time, there is no warning system or evacuation plan in operation.
- 4.5 Evaluation: Considering the function that is served by the operational facility, maintenance is considered adequate.

SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: The normal pool (elevation 1409.5 feet M.S.L.) maintained by a low stage orifice (0.75 foot high by 2.25 feet long) on the upstream side of the riser was established at an elevation capable of storing 0.23 watershed inches (100-year sediment pool). The high stage riser crest (elevation 1428.1 feet M.S.L.) was established at an elevation to store an additional 1 inch of floodwater plus 0.34 inch of sediment load. The capacity of the principal spillway (218 c.f.s. with the reservoir level at the emergency spillway crest) was established by consideration of the following factors:

- 1) The capability of evacuating the flood storage space within a reasonable time (\pm 10 days).
- 2) Not passing damaging flows downstream.
- 3) The capability of the reservoir to store the floodwaters.

The crest elevation of the emergency spillway was established at the elevation required to store the 100-year, 10-day rainfall. The elevation of the top of dam (elevation 1448.7 feet M.S.L.) was established by the maximum elevation reached in passing the freeboard hydrograph. The freeboard hydrograph is that computed from rainfall comparable to Probable Maximum Precipitation (PMP) as used by the Corps of Engineers and is therefore comparable to the Probable Maximum Flood (PMF).

5.2 Hydrologic Records: No rainfall data or stream flow records were available.

5.3 Flood Experience: No exact high water marks or dates were available. However, a local landowner indicated that the reservoir has risen above the riser crest in the past.

5.4 Flood Potential: Design features of the dam and reservoir were established by the SCS by routing various hydrographs as noted in paragraph 5.1.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1, paragraph 1.3.3.

Regulation of flow from the reservoir is automatic. Normal flows are maintained by the low stage orifice in the riser with crest elevation 1409.5 feet M.S.L. and

the high stage inlet with a crest of 1428.1 feet M.S.L. Water entering these inlets flows through the dam in a 36 inch diameter reinforced concrete conduit. Water also flows past the dam through an ungated, vegetated, side-channel emergency spillway in the event water in the reservoir rises above an elevation of 1440.0 feet M.S.L.

Outlet discharge capacity, reservoir area and storage capacity, and hydrograph and routing determinations were obtained from reports and computations furnished by the SCS. The routing of the emergency and freeboard hydrographs began with the reservoir level at normal pool.

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on the reservoir performance in various hydrographs is shown in the following table:

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal	Hydrograph		
		Principal Spillway (a)	Emergency Spillway	Free- board (b)
Peak flow, c.f.s.				
Inflow	-	-	5159	16,180
Outflow	-	218	3400	15,670
Peak elev., ft. M.S.L.	1409.5	1428.1	1443.5	1448.7
Emergency spillway (elev. 1440.0 ft. M.S.L.)				
Depth of flow, ft.	-	-	3.5	8.7
Avg. velocity, f.p.s.	-	-	7.7	12.8
Non-overflow section (elev. 1448.7 ft. M.S.L.)				
Depth of flow, ft.	-	-	-	-
Duration of over- topping, hrs.	-	-	-	-
Avg. velocity, f.p.s.	-	-	-	-
Tailwater elev., ft. M.S.L. (c)	1367.0	-	-	-

(a) 100-year, 10-day volume produces the most conservatively large indication of flood control storage required. Detailed discharge hydrograph was not determined.
 (b) PMF by COE standards.
 (c) Tailwater at time of inspection.

NAME OF DAM: DRY RUN NO. 102

5.7 Reservoir Emptying Potential: The time to drawdown the reservoir level from the crest of the emergency spillway (discharge of 218 c.f.s.) to the crest of the riser (discharge of 38 c.f.s.) is about 12 hours. The time to draw the reservoir down from the riser crest to the low stage orifice crest is approximately 5 days. With the 36 inch reservoir drain opened, the reservoir can be drained from normal pool to elevation 1388.1 feet M.S.L. in about 2 hours. Reservoir drawdown was estimated neglecting inflow.

5.8 Evaluation: Hydrologic and hydraulic determinations of the project as prepared by the SCS appear reasonable. The reservoir and spillway are designed to pass a flood essentially equal to PMF which would be developed under standards used by the Corps of Engineers. The project will pass the PMF without overtopping the dam.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: Records of borings and test pits shown on the as-built drawings were used to determine the foundation conditions. Field observations also indicated the soils are mostly silty sand (10 to 30 feet deep) with gravel, cobbles and boulders. The upper bedrock is primarily speckled, fractured, hard granodiorite of the Precambrian Pedlar Formation. There are some thin silt seams in the upper weathered zone with an occasional pegmatite and small voids below. The cutoff trench had been excavated into the weathered bedrock and grouted in the fracture zones.

The deep cut for the spillway was excavated into silty sand and rock fragments with a few exposures of hard blocky granodiorite.

6.2 Stability Analysis

6.2.1 Visual Observations: No tension cracks or other evidence of movement such as sloughing of the embankment slopes or movement at or beyond the toe were noticed. No seepage was observed on the face of the dam or at the abutments. Erosion has started on an upstream path and tire tracks on the downstream face. Small trees have grown between the rocks in the slope gutters and rock toe drain.

6.2.2 Design Data: No stability analyses were available.

6.2.3 Operating Records: Recent annual maintenance inspection reports included in Appendix V have called for cutting small trees, a warning sign at principal spillway pipe, and treatment of bare vehicle tracks.

6.2.4 Post-Construction Changes: There have been no known post-construction changes.

6.2.5 Seismic Stability: Dry Run Dam No. 102 is located in Seismic Zone 2 and is considered to have no hazard from earthquakes according to the Recommended Guidelines for Safety Inspection of Dams provided static stability conditions are satisfactory and conventional safety margins exist.

NAME OF DAM: DRY RUN NO. 102

6.3 Evaluation: Since no stability analyses were available, a detailed stability assessment could not be made. There does not appear to be any adverse condition which affects the structural stability of the dam. The only deficiencies observed include moderate erosion on a path and in vehicle tracks, and scattered growth of small trees which should be removed. These recurring items have been noted in the previous annual maintenance inspection reports after which some remedial action apparently had been taken in the past.

NAME OF DAM: DRY RUN NO. 102

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The dam, as designed, will prevent overtopping under PMF conditions. The hydrologic and hydraulic data available were sufficient to evaluate the spillway capacity. No evidence of seepage or embankment distress were observed that would threaten the integrity of the dam. Design soils, foundations, and stability reports were not available for review.

The dam is generally in good condition with the exceptions of the maintenance items noted.

7.2 Recommended Remedial Measures: The filling and reseeding of the tire tracks on the embankment should be repaired without delay to prevent erosion. Also, some means from preventing further vehicular traffic on the embankments should be considered immediately. If restricting vehicular traffic is not possible, a means of protecting the embankment against erosion should be implemented. The inspection revealed certain maintenance items listed below which should be scheduled during the annual maintenance period.

- 1) Cut all tree growth on embankment and rock toe drains.
- 2) In addition to areas already noted, reseed all bare areas on the embankment including footpath on the upstream side.
- 3) A staff gage should be installed to monitor reservoir elevations above normal pool.

APPENDIX I

PLATES

CONTENTS

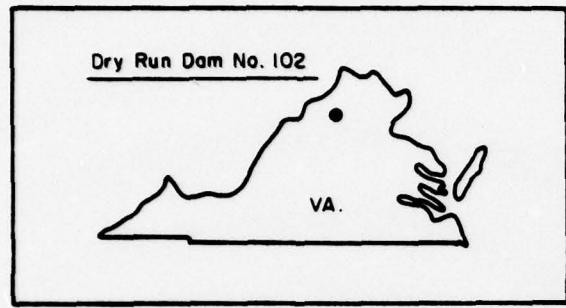
Location Plan

Plate 1: Plan of Structural Works

Plate 2: Plan-Profile of Principal Spillway

Plate 3: Principal Spillway

NAME OF DAM: DRY RUN NO. 102



Dry Run Dam No. 102

VA

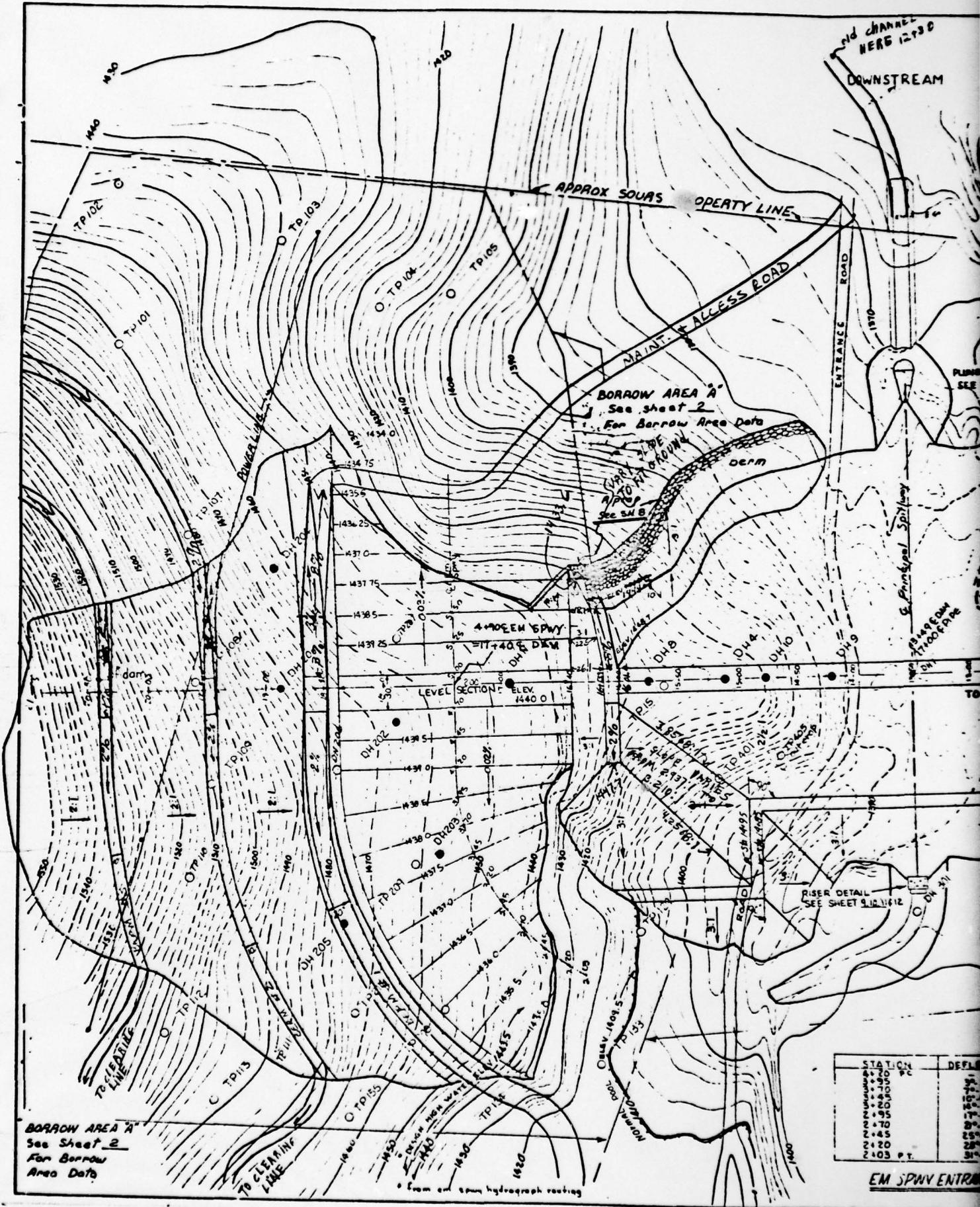
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APPROX 70 MILES S E
OF LURAY, VA

LOCATION MAP

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SCALE

LOCATION PLAN

DRY RUN DAM NO.102



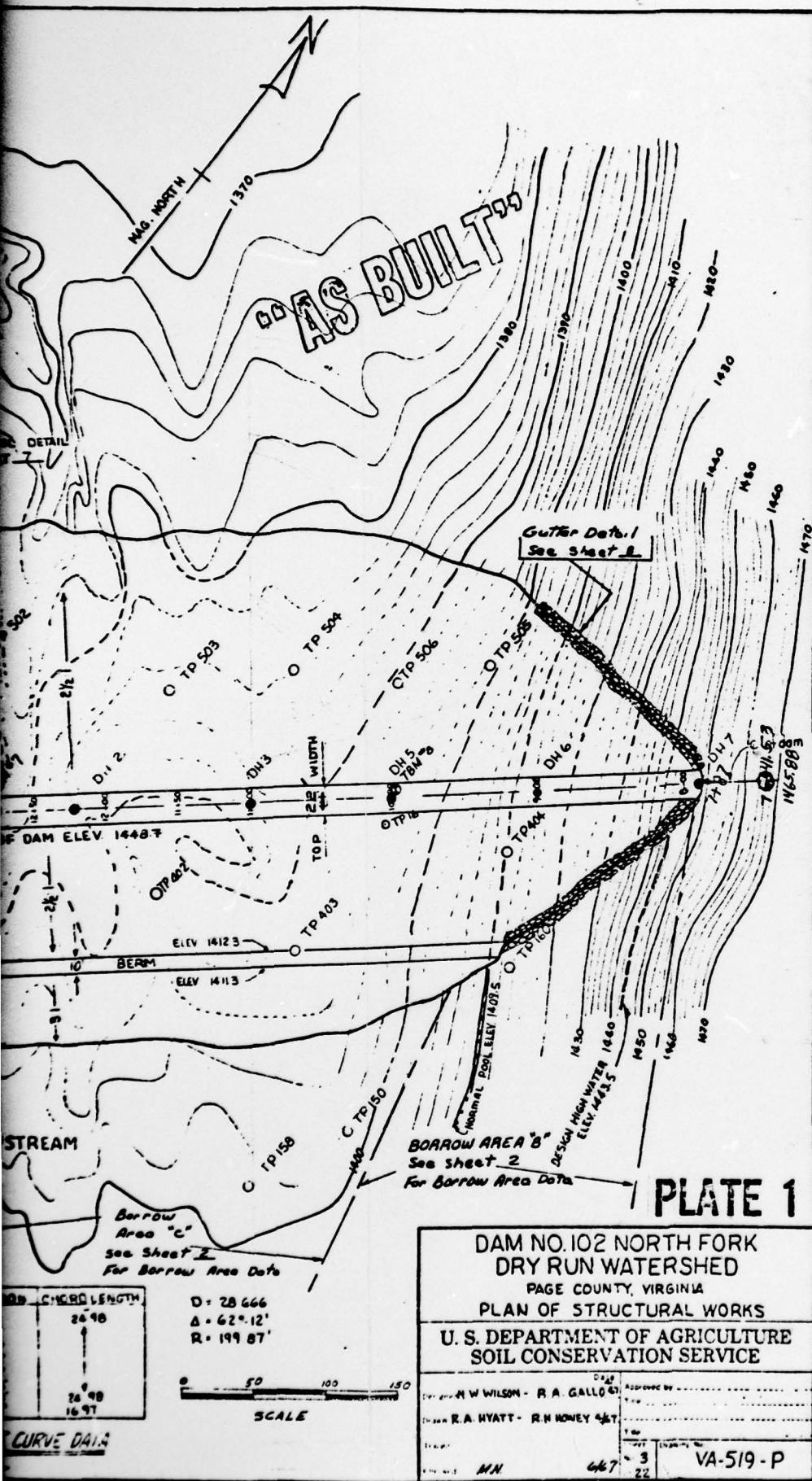


PLATE 1

DAM NO. 102 NORTH FORK
DRY RUN WATERSHED

PAGE COUNTY, VIRGINIA

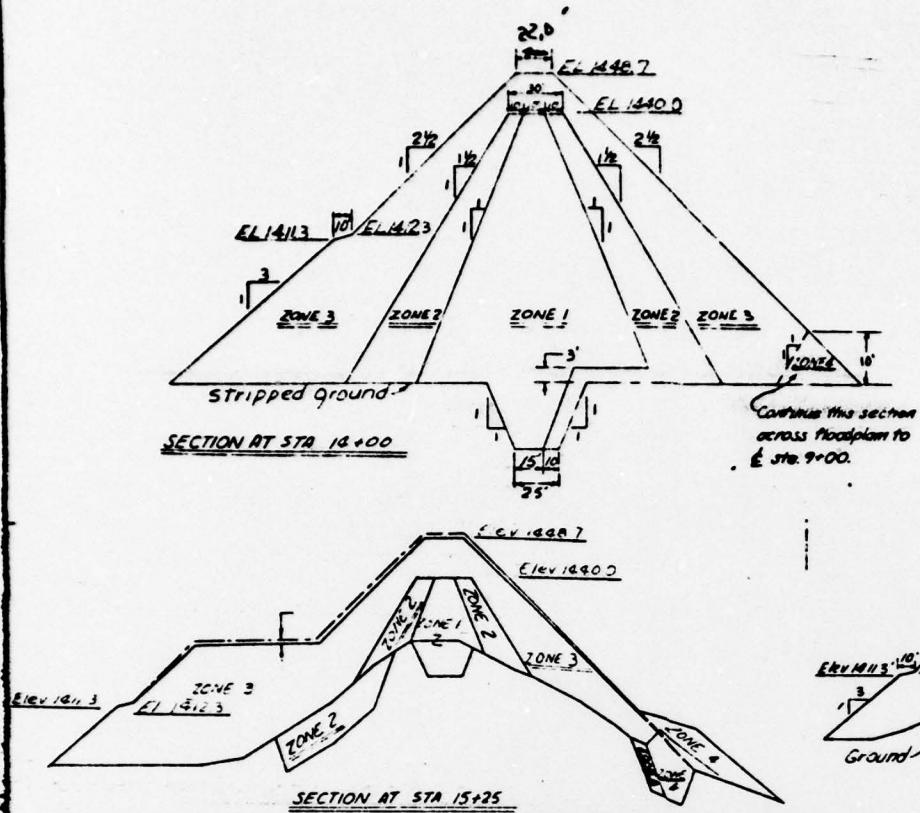
PLAN OF STRUCTURAL WORKS

**U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE**

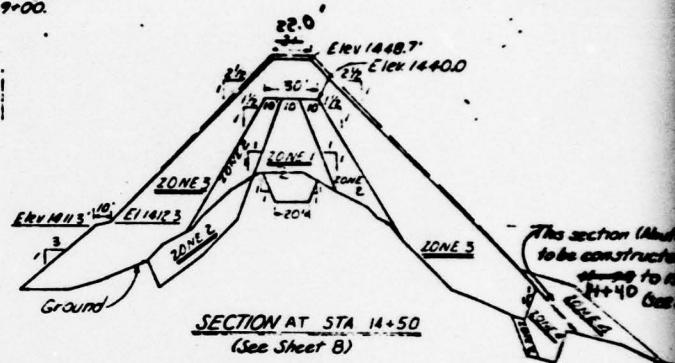
H.W. WILSON - R.A. GALLO
R.A. HYATT - R.M. HONEY *4/27*

467-3
22 VA-519-F

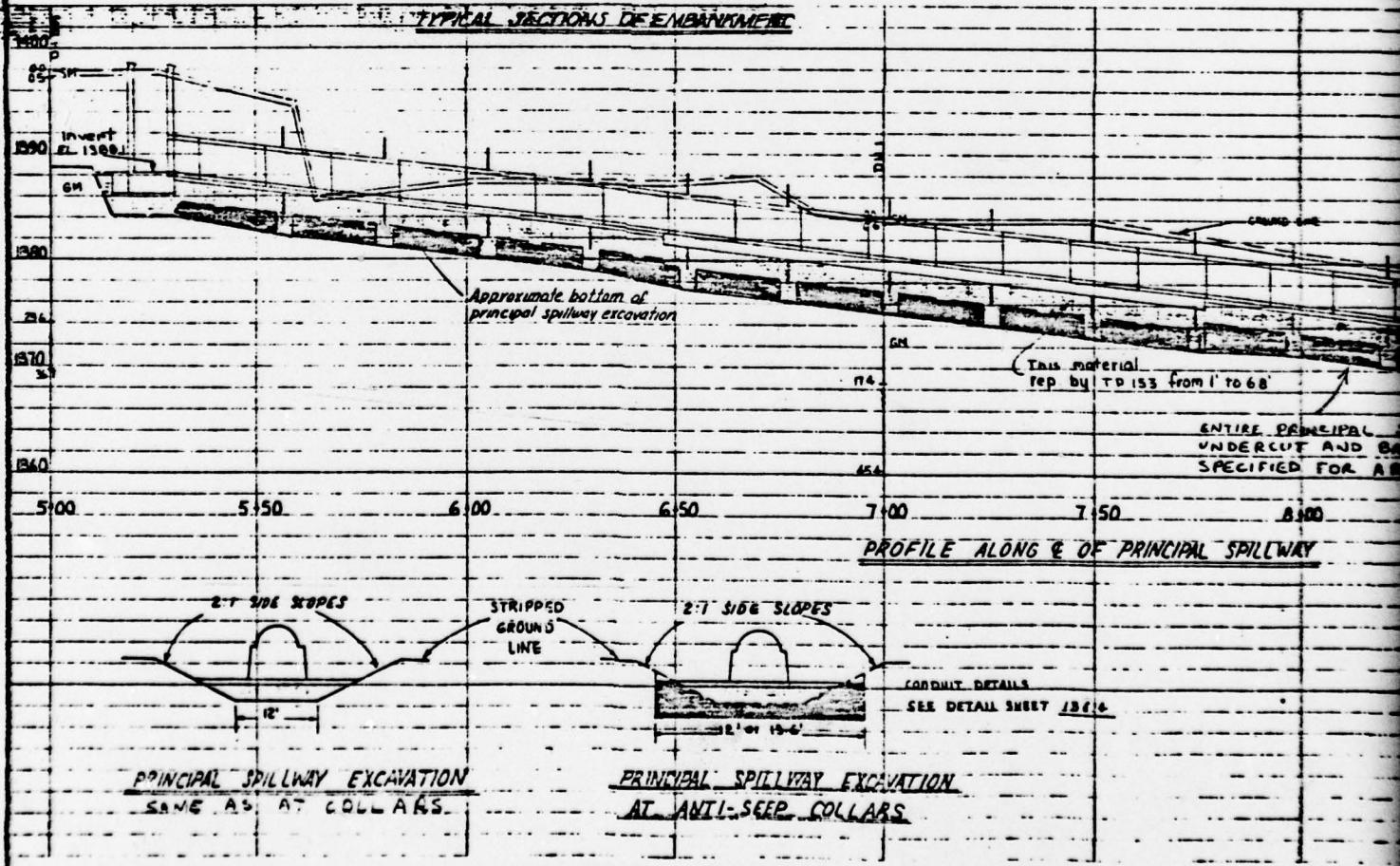
2



"AS BUILT"



TYPICAL SECTIONS OF EMBANKMENT

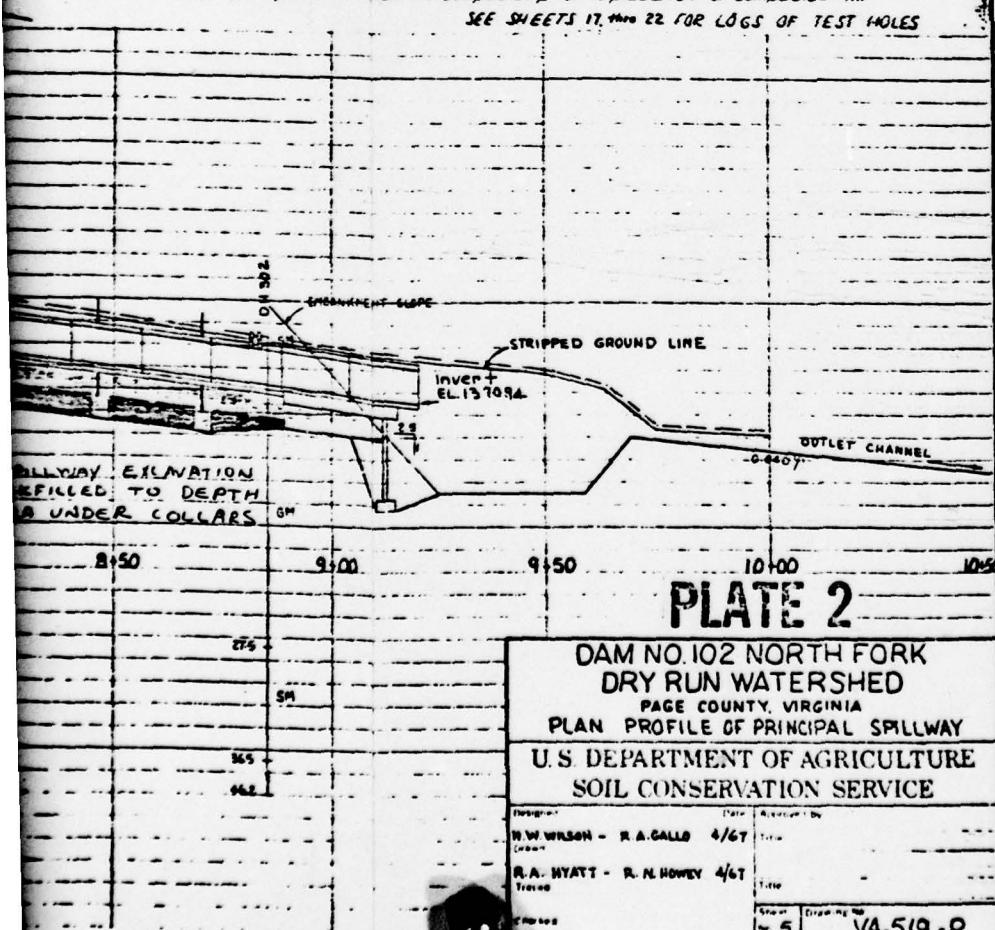


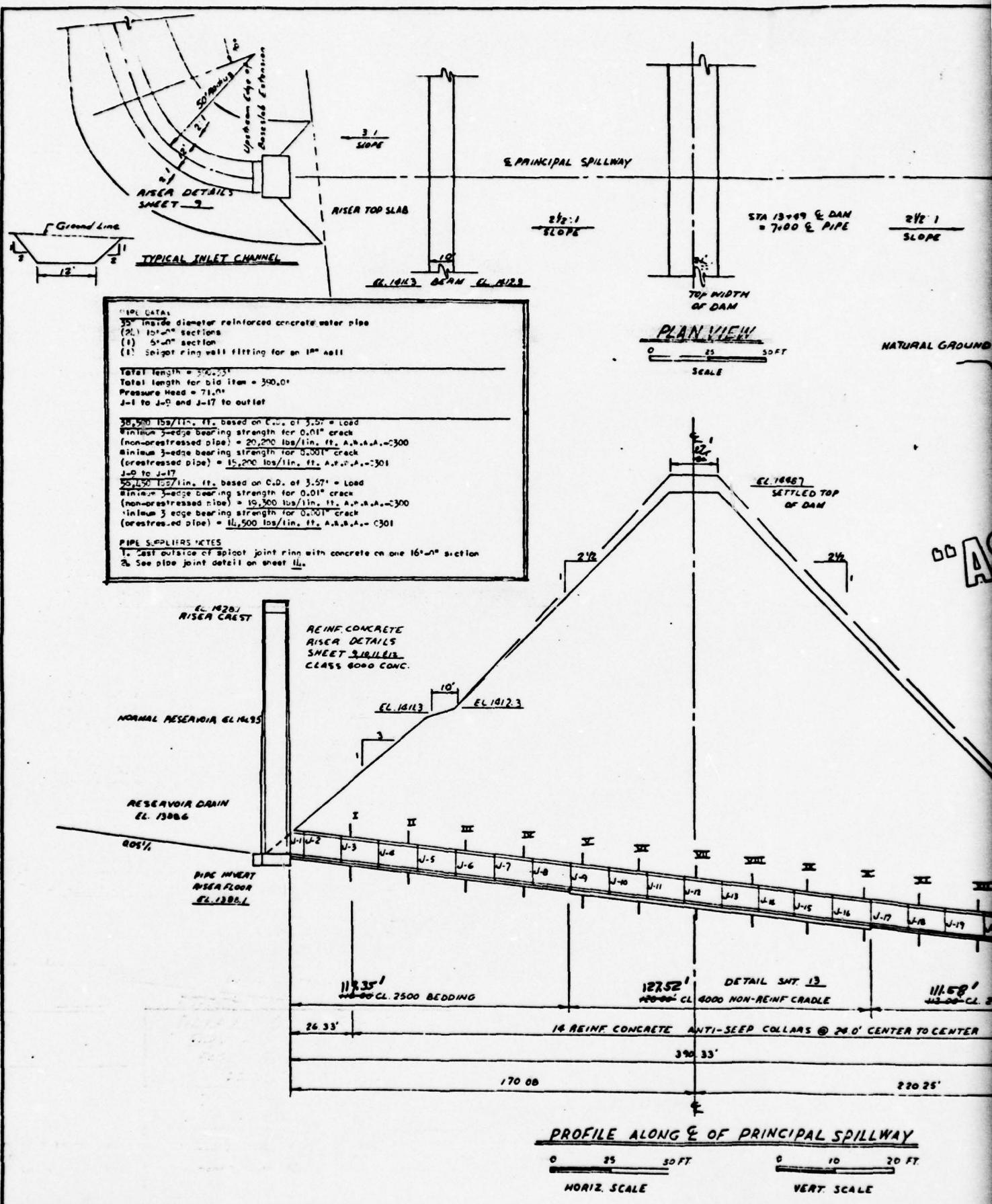
EARTH FILL REQUIREMENTS						
ZONE	MATERIAL	MAX. MAX. EXCAVATION	RECOMENDED EXCAVATION	COMPACTOR	CONTRACTOR	CLASSIFICATION
1	SILTS (NATURAL CLASSIFICATION) and clayey sand (X-SW) represented by TP103 from 1' to 6' TP153 from 1' to 6' & TP201 from 2' to 12' 6' TP208 from 5' to 22' TP108 from 1' to 3' 5' to 6' TP151 from 1' to 9' selected from the emergency Spillway, borrow area and borrow area B.	6"	9"	from -1% to +2% of optimum	A	100 % max density ASTM D698 method A
2	Silty sand (S) represented by TP207 from 1' to 2' and from 1' to 2' 6' TP157 from 1' to 2' and TP1C3 from 1' to 7' selected from the emergency Spillway and borrow area A.	6"	9"	from -1% to +2% of optimum	A	100 % max density ASTM D698 method A
3	Silty gravel (GM) represented by TP156 from 1' to 7' from borrow area C.	16"	24" natural	V	see SPEC SA	
4	Silty gravel (GM) represented by TP132 from 1' to 7.5' from borrow area C.	16"	24" natural	X	see SPEC SA	

11 Maximum lift thickness prior to compaction
 12 For typical compaction curves see sheet 22.
 13 Zone 4 material shall contain less than 10% fines.

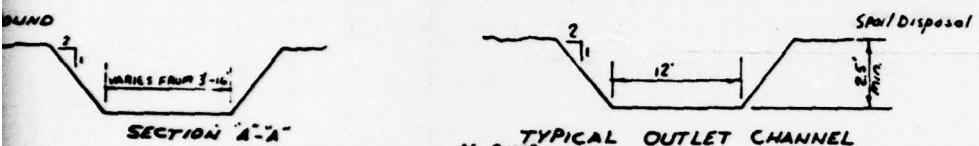
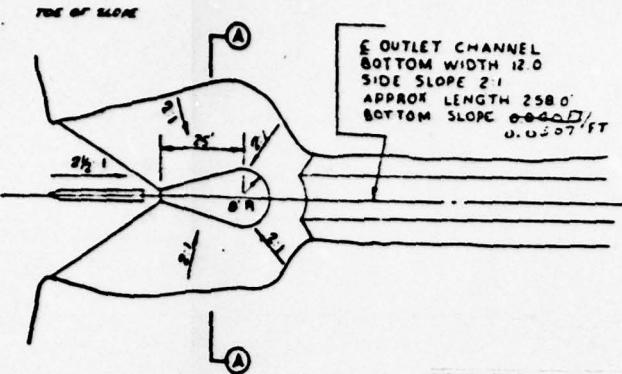
NOTE: The foundation surface throughout the base area of the dam shall be scoured to a depth of 6 inches and compacted prior to placement of compacted fill.

SEE SHEETS 17 thru 22 FOR LOGS OF TEST HOLES





PROFILE ALONG E OF PRINCIPAL SPILLWAY



TYPICAL OUTLET CHANNEL
AS-BUILT INVERT ELEVATIONS

JOINT	DIST FROM RAISER TOE	INVERT ELEVATIONS	SLOPE
J-1	08.00	1388.10	
J-2	37.70	1387.86	
J-3	67.00	1387.13	
J-4	96.30	1386.63	
J-5	125.60	1385.72	
J-6	154.90	1385.02	
J-7	184.20	1384.32	
J-8	213.50	1383.61	
J-9	242.80	1382.91	
J-10	272.10	1382.20	
J-11	311.40	1381.50	
J-12	340.70	1380.80	
J-13	370.00	1380.09	
J-14	409.30	1379.39	
J-15	448.60	1378.68	
J-16	477.90	1377.98	
J-17	517.20	1377.28	
J-18	546.50	1376.57	
J-19	585.80	1375.87	
J-20	615.10	1375.16	
J-21	644.40	1374.46	
J-22	673.70	1373.76	
J-23	712.00	1373.05	
J-24	741.30	1372.35	
J-25	770.60	1371.64	
OUT	799.90	1370.94	

COLLAR	DIST FROM RAISER TOE	INVERT ELEV'S
I	26.33	1386.96
II	50.33	1385.90
III	74.33	1384.84
IV	98.33	1383.79
V	122.33	1382.73
VI	146.33	1381.68
VII	170.33	1380.62
VIII	194.33	1379.56
IX	218.33	1378.51
X	242.33	1377.45
XI	266.33	1376.40
XII	290.33	1375.34
XIII	314.33	1374.28
XIV	338.33	1373.23

AS BUILT
REINF CONC. BENT
CLASS 8000 CONC
DETAILS SHEET 11
EL 1370.94
EL 1368.00
OUTFALL CHANNEL
SLOPE 0.0507 FT.
DAM NO.102 NORTH FORK
DRY RUN WATERSHED
PAGE COUNTY, VIRGINIA
PRINCIPAL SPILLWAY
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Dated Wilson L. Gallo 9/67
Dian Raymond N. Houey 9/67
Time 7/22
2

PLATE 3

APPENDIX II

PHOTOGRAPHS

CONTENTS

- Photo 1: Eroded Vehicular Tracks on Downstream Slope**
- Photo 2: Footpath on Upstream Slope (Near Riser)**
- Photo 3: View of Riser From Upstream Face of Dam**
- Photo 4: Outlet Pipe and Stilling Basin**
- Photo 5: Rock Toe on Downstream Side of Dam**
- Photo 6: Emergency Spillway and Left Abutment**

Note: Photographs were taken 15 November 1978.

NAME OF DAM: DRY RUN NO. 102

DRY RUN DAM No. 102

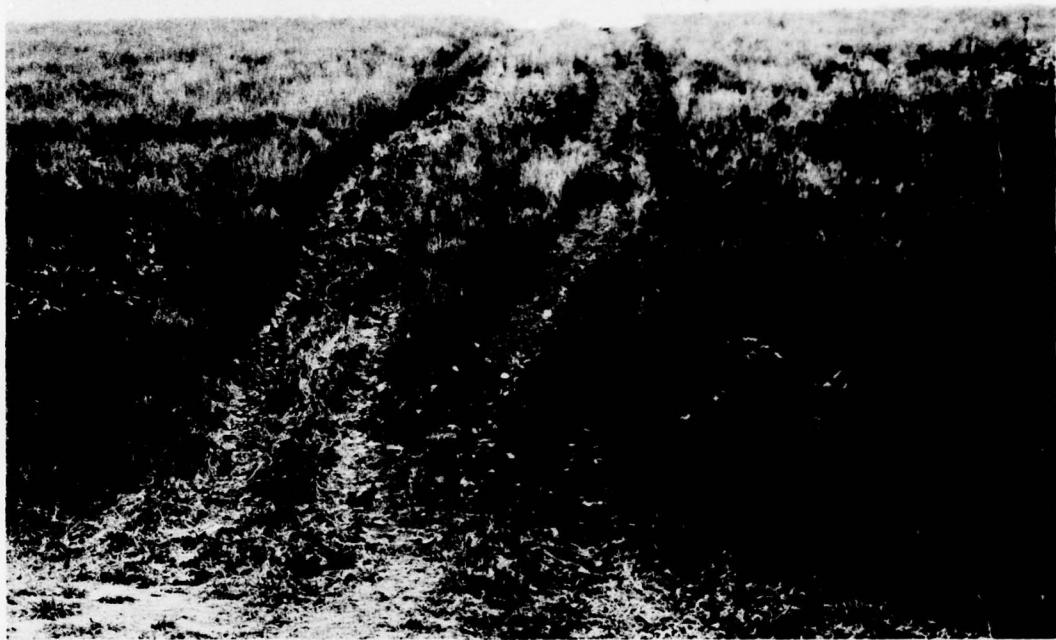


PHOTO 1. Eroded Vehicular Tracks on Downstream Slope

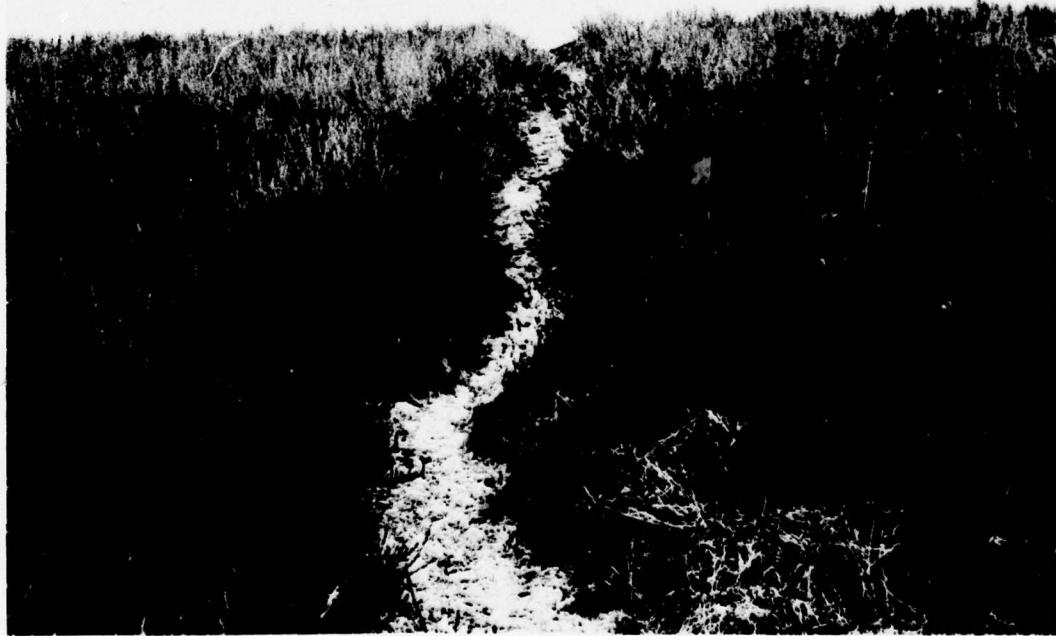


PHOTO 2. Footpath on Upstream Slope (Near Riser)

DRY RUN DAM No. 102



PHOTO 3. View of Riser From Upstream Face of Dam



PHOTO 4. Outlet Pipe and Stilling Basin

DRY RUN DAM No. 102



PHOTO 5. Rock Toe on Downstream Side of Dam



PHOTO 6. Emergency Spillway and Left Abutment

APPENDIX III

CHECK LIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name of Dam Dry Run No. 102 County Page _____ State Virginia Coordinates Lat. 3838.6
Long. 7821.9

Date Inspection 15 November 1978 Weather Cloudy, Light Rain Temperature 60°F.

Pool Elevation at Time of Inspection 1409.6 ft. M.S.L. Tailwater at Time of Inspection 1367.0 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:

T. W. Smith
W. L. Sheaffer
T. J. Dougan

T. W. Smith Recorder

EMBANKMENT

Name of Dam: DRY RUN NO. 102

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

SURFACE CRACKS

None observed.

UNUSUAL MOVEMENT OR
CRACKING AT OR BEYOND
THE TOE

None observed.

III SLOUGHING OR EROSION OF
EMBANKMENT AND ABUTMENT
SLOPES

No sloughing was observed. There is some erosion in tire tracks on the downstream slope near the principal spillway outlet and in a path on upstream slope near riser. Roadway tracks are exposed on the left side on the top of the dam.

It is recommended that topsoil be placed on the bare areas and planted with grass seed. The access for vehicles on the downstream slope should be blocked-off.

VERTICAL AND HORIZONTAL
ALIGNMENT OF THE CREST

Good

RIPRAP FAILURES

None

SURFACE OF
SLOPES

There are scattered dried-out patches of grass and branches of trees in the lower 20 ft. of slope on the upstream side. There is good thick vegetation on the rest of the upstream slope and on the entire downstream slope.

The slopes were constructed at a 2.5:1 ratio on both sides of the dam except for a 3:1 slope in the lower upstream side.

It is recommended that the dried-out areas be reseeded and the wood debris be removed.

EMBANKMENT

Name of Dam: DRY RUN NO. 102

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONSTRUCTION MATERIALS	The dam was constructed in four zones according to the as-built drawings. Zone 1 in the core consists of silt and clay. Brown, damp, dense sand, silt, gravel, cobbles and rock fragments were observed on the surface in various portions of the dam representing granular Zone 3.	It is recommended that the trees, brush and any other debris be removed from the slope gutters and riprap.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	There are light-brown, damp, silty sand and rock fragments with boulders in the hillside at the right abutment with granodiorite beneath. Boulders of hard rock form the slope gutters at the right abutment. Some small trees and brush have grown between the boulders on the upstream and downstream gutters. The dam, at the emergency spillway, consists of silty sand and rock fragments with granodiorite beneath.	
ANY NOTICEABLE SEEPAGE	No seepage was observed on the downstream embankment slope or toe. Two old stream channels on the right side in the woods were dry. Tree stumps, boulders and trash have been dumped in the channels.	
STAFF GAGE AND RECORDER	None	
DRAINS	A rock toe drain consisting of very hard boulders (1.5 to 3 ft. diameters) extends for the length of the dam except in the vicinity of the outlet for the principal spillway. Scattered small trees have grown in the vicinity and between the boulders. The rock drain is approximately 15 ft. high x 20 ft. wide.	It is recommended that the trees and other vegetative growth be removed.

Sheet 3

EMBANKMENT

Name of Dam: DRY RUN NO. 102

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
FOUNDATION	According to the borings and test pits shown on the construction plans, the dam was constructed on silty sand with gravel, cobbles and boulders at least 10 ft. deep. The bedrock is primarily hard, brown and green granodiorite of the Precambrian Pedlar Formation. The bedrock in the bottom of the cutoff trench was grouted in fractured zones.	

Name of Dam: DRY RUN NO. 102

OUTLET WORKS

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
<u>CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT</u>	No unusual cracking or spalling of the outlet pipe was observed.	
<u>INTAKE STRUCTURE</u>	Concrete reinforced riser shows no signs of spalling or cracking.	
<u>III-5 OUTLET STRUCTURE</u>	The outlet structure consists of 30 in. diameter R.C.P. exiting into a stilling basin approximately 25 ft. wide x 60 ft. long with boulder riprap along the bottom and banks. The outlet flow in the pipe was 0.1 ft. deep.	
<u>OUTLET CHANNEL</u>	The outlet channel is approximately 12 ft. wide at bottom with channel slope of 2-3%. The channel is lined with cobbles and small boulders.	
<u>EMERGENCY GATE</u>	The emergency gate is located on upstream side of riser and can be used to drain the reservoir.	

Name of Dam: DRY RUN NO. 102

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None	
APPROACH CHANNEL	The approach channel enters the emergency spillway along left side of reservoir with a 2½ adverse slope in silty sand and rock fragments. There is a thick vegetative cover.	
DISCHARGE CHANNEL	The discharge channel is located beyond the left end of the dam. The soil is silty sand and rock fragments with a thick vegetative cover including a few small pines and bushes.	The pine trees and bushes should be removed.
BRIDGE AND PIERS	None	
CONFINING SLOPES	Residual silty sand with rock fragments is exposed in the 100 ft. + cut on left side. The slope is well covered with vegetation and a few small pine trees except for vehicle tracks in the lower part near the center. The slope is cut at a 2:1 ratio with two 10 ft. berms separated by a 40 ft. interval. There are a few exposures of hard granodiorite in large blocks. Silt, sand, gravel and rock fragments comprise the 3:1 slope on the right side for the extension of the dam embankment.	It is recommended that the trees be removed and grass seed (same as existing) be planted in the bare tracks on the left slope.

Name of Dam: DRY RUN NO. 102

INSTRUMENTATION

VISUAL EXAMINATION

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

MONUMENTATION/SURVEYS

None observed.

OBSERVATION WELLS

None observed.

III-WEIRS
-7

None

PIEZOMETERS

None

OTHER

Name of Dam: DRY RUN NO. 102

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The slopes are generally gentle near the reservoir becoming steeper toward the woods. Clear springs emanate from silty sand and rock fragments in extensive areas on the east and southeast sides of the reservoir. The clear springs outlet above sandy clay at lake level. The southeast side is swampy near the inlet of Dry Run. The southwest side is dry except for a wet swale near the access road. There are two cabins located on the southeast corner.	
SEDIMENTATION	No unusual sedimentation was noted.	

DOWNSTREAM CHANNEL

Name of Dam: DRY RUN NO. 102

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	<p>There are sand, gravel, cobbles and boulders in the channel which is free of obstructions and debris.</p>	
SLOPES	<p>The slopes of silty sand, gravel, cobbles and boulders are well defined at a 2:1 ratio.</p>	
APPROXIMATE NO. OF HOMES AND POPULATION	<p>There are 50 to 60 homes located in the 4 mi. stretch downstream of the dam with most of the homes being located along Route 667. Population is estimated to be between 250 to 350.</p>	

APPENDIX IV

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	The Plan of Dam is shown on the as-built drawings.
REGIONAL VICINITY MAP	The vicinity map is presented in this report as the Location Plan.
CONSTRUCTION HISTORY	The contractor and completion date were obtained from the COE. The dam was constructed by Wiley Jackson in 1969.
IV-1 TYPICAL SECTIONS OF DAM	Typical sections are included in the as-built drawings and are presented in this report as Plates 2 and 3.
HYDROLOGIC/HYDRAULIC DATA	Hydrologic and hydraulic calculations were available.
OUTLETS - PLAN and DETAILS	shown on as-built drawings
- CONSTRAINTS and DISCHARGE RATINGS	contained in the hydrologic/hydraulic calculations.
RAINFALL/RESERVOIR RECORDS	No rainfall or reservoir records are available at the dam.

Name of Dam: DRY RUN NO. 102

ITEM	REMARKS
DESIGN REPORTS	A Design Report was not available for this inspection report.
GEOLOGY REPORTS	A Geologic Report was not available for this inspection.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Hydrology and hydraulic calculations were available for this inspection report. Stability analyses were not available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Test pit and boring records, results of field permeability, water pressure tests and compaction curves are presented in the as-built drawings.
POST-CONSTRUCTION SURVEYS OR DAM	No known post-construction surveys were found.
BORROW SOURCES	Borrow areas in the reservoir area and downstream of the emergency spillway are shown in the as-built drawings.

Name of Dam: DRY RUN NO. 102

ITEM	REMARKS
MONITORING SYSTEMS	No monitoring systems have been provided.
MODIFICATIONS	Data obtained during inspection agrees very closely with as-built drawings indicating that no major modifications were made.
HIGH POOL RECORDS	None are available.
IV-3 POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None are available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	No prior accidents or failure of the dam have been noted.
MAINTENANCE OPERATION RECORDS	Annual inspections are conducted by the Shenandoah Valley Soil and Water Conservation District with the assistance of the Town of Luray and the SCS to make recommendations for maintenance and upgrading of the dam if needed. Copies of the reports are included in Appendix V.

Name of Dam: DRY RUN NO. 102

<u>ITEM</u>	<u>REMARKS</u>
-------------	----------------

SPILLWAY PLAN

SECTIONS Information contained in the as-built drawings.
DETAILS

OPERATING EQUIPMENT
PLANS & DETAILS

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 2.08 sq.mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1409.5 ft. M.S.L. (25 ac.-ft.)

ELEVATION TOP EMERGENCY SPILLWAY CREST
(STORAGE CAPACITY): 1440.0 ft. M.S.L. (340 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1443.5 ft. M.S.L.

ELEVATION TOP DAM: 1448.7 ft. M.S.L. (settled)

CREST: Emergency Spillway

- a. Elevation 1440.0 ft. M.S.L.
- b. Type Earth side-channel with vegetative cover
- c. Width 200 ft.
- d. Length 350 ft. total (240 ft. approach, 30 ft. level section,
80 ft. exit)
- e. Location Spillover Outside left abutment
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type Drop-inlet concrete riser
- b. Location Riser in reservoir with 36 in. diameter reinforced
concrete outlet pipe
- c. Entrance inverts 1409.5 ft. M.S.L. (normal pool),
1428.1 ft. M.S.L. (riser crest)
- d. Exit inverts 1370.9 ft. M.S.L. (36 in. diameter outlet pipe)
- e. Emergency draindown facilities reservoir drain (36 in. diam.
slide gate)

HYDROMETEOROLOGICAL GAGES: None available

- a. Type
- b. Location
- c. Records

MAXIMUM NON-DAMAGING DISCHARGE Unknown

Name of Dam: DRY RUN NO. 102

APPENDIX V

ANNUAL MAINTENANCE INSPECTION REPORTS

REPORT ON ANNUAL MAINTENANCE INSPECTION OF
DRY RUN WATERSHED FLOOD CONTROL STRUCTURES

The Shenandoah Valley Soil and Water Conservation District performed their annual inspection of the completed flood water retarding structures on the Dry Run Watershed, in Page County, Virginia May 23, 1978. The structures inspected were dams 101 and 102. District Director Arlis Frymyer performed the inspection with the assistance of Don Smith, Luray Town Manager and Sam Linkenhoker, District Conservationist.

The results of the inspections are listed below as agreed to maintenance items.

Dam 101 (Lake Arrowhead)

1. Remove small cedars on downslope of dam.
2. Remove brush from knoll on eastern end of dam and spray undergrowth with brush killer and oil.
3. Spray and remove small trees on drainage ditches in the spillway.
4. Replace bolts on walkway structure.

Dam 102 (Lake Morning Star)

1. Paint a large warning (DANGER KEEP OUT) on the exit end of the principal spillway pipe.

Damaged areas on Dam 102, as a result of motor vehicles, had been repaired and appeared in excellent condition with seeding and planking.

Arlis Frymyer
Arlis Frymyer, Director

Donald Smith, Town Manager

Samuel W. Linkenhoker
Samuel W. Linkenhoker,
District Conservationist

REPORT OF ANNUAL MAINTENANCE INSPECTION OF
DRY RUN WATERSHED FLOOD CONTROL STRUCTURES

The Shenandoah Valley Soil and Water Conservation District performed their annual inspection of the completed flood water retarding structures on the Dry Run Watershed, in Page County Virginia April 21, 1977. The structures inspected were dams 101 and 102. District directors Joyce Burner and Clark Spitler performed the inspection with the assistance of Don Smith, Luray Town Manager and Sam Linkenhoker, District Conservationist.

The results of the inspections are listed below as agreed to maintenance items.

Dam 101 (Lake Arrowhead)

1. Remove brush and trees from the upstream slope of dam and paint the stumps with Brush-Killer and oil.
2. Remove the common mullein (*Verbascum thapsus*) from the slopes of the dam and spillway by either grubbing or spraying with 2,4-D mixed in common detergent.
3. Spray the brush on the slopes of the spillway with Brush-Killer.
4. Install a post in the existing lane which is located around the southern edge of the lake to prohibit vehicular travel on said lane.
5. Remove all downed trees that are located within the flood pool area.

Dam 102 (Lake Morning Star)

1. Paint a large warning (DANGER KEEP OUT) on the exit end of the principal spillway pipe.
2. Remove all locust sprouts from the back side of the dam and paint the stumps with Brush-Killer and fuel oil.

Clark W. Spitler
Clark Spitler, Director

Joyce P. Burner
Joyce Burner, Director

Donald Smith
Donald Smith, Town Manager

SHENANDOAH VALLEY SOIL AND WATER CONSERVATION DISTRICT
REPORT OF ANNUAL MAINTENANCE INSPECTION OF WATERSHED DAMS IN

DRY RUN WATERSHED PROGRAM

May 27, 1976

Inspection of the dams on Dry Run, Page County, Virginia was made May 27, 1976 by Clark Spitzer, Martha Ann Atwood, and Joyce Burner, Shenandoah Valley Soil and Water Conservation District Directors. They were assisted by Donald Smith, Town Manager, and Jimmie Griffith, Water Superintendent, Town of Luray. The group was accompanied by John D. Crist, Soil Conservation Service.

The following corrections were agreed upon by all parties involved:

Dam No. 102 - 1. Remove locust and willow trees from dam and spillway and paint stumps with 245T and fuel oil.
2. Remove log from floodpool area.
3. Paint sign on drain pipe at stilling pool to keep people out of pipe. Danger, Keep Out, Town of Luray.

Dam No. 101 - 1. Remove locust and willow trees from dam and spillway and paint stumps with 245T and fuel oil.
2. Remove large logs from dam and waterline.

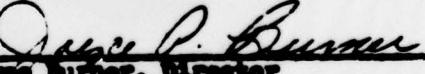
This report is concurred by:



Clark Spitzer, Director
Shenandoah Valley Soil and Water Conservation District



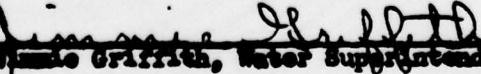
Martha Ann Atwood, Director
Shenandoah Valley Soil and Water Conservation District



Joyce P. Burner
Shenandoah Valley Soil and Water Conservation District



Donald G. Smith, Town Manager Town of Luray



Jimmie Griffith, Water Superintendent Town of Luray



John D. Crist, District Conservationist
Soil Conservation Service

DISTR: State Office 2 cys.
Area Office
Luray Field Office
Town of Luray
Shenandoah Valley SWCD

SHENANDOAH VALLEY SOIL AND WATER CONSERVATION DISTRICT
REPORT OF ANNUAL MAINTENANCE INSPECTION OF WATERSHED DAMS IN

DRY RUN WATERSHED PROGRAM

May 8, 1975

Inspection of the dams on Dry Run, Page County, Virginia was made May 8, 1975 by Clark Spitler, Shenandoah Valley Soil and Water Conservation District Director. He was assisted by Dempsey Stokes and Haywood Nichols from the Town of Luray and John D. Crist, Soil Conservation Service.

The following corrections were agreed upon by all parties involved:

Dam No. 101 - 1. All small locust on dam and spillway will be cut and sprayed with 24ST and fuel oil.
2. The larger logs will be removed from the dam to prevent clogging of spillway.
3. Two small galled areas will be seeded to Ky. 31 fescue and mulched with straw.

Dam No. 102 - 1. All small locusts on the dam and spillway will be cut and sprayed with 24ST and fuel oil.
2. Two small galled areas will be seeded to Ky. 31 fescue and mulched with straw. The overhang on the top galled area will be knocked off and the area planted to locust to hold the sod in place.

This report is concurred by:

Clark Spitler

Clark Spitler, Shenandoah Valley Soil and Water Conservation District Director

Dempsey H. Stokes

Dempsey Stokes, Town of Luray

J. Haywood Nichols

Haywood Nichols, Town of Luray

John D. Crist

John D. Crist, District Conservationist, Soil Conservation Service

DISTR: State Office 2 cys.
Area Office
Luray Field Office
Town of Luray
Shenandoah Valley SWCD

SHENANDOAH VALLEY SOIL AND WATER CONSERVATION DISTRICT
REPORT OF ANNUAL MAINTENANCE INSPECTION OF WATERSHED DAMS IN

DRY RUN WATERSHED PROGRAM

April 4, 1974

Inspection of the dams was made April 4, 1974 by James Aleshire and Clark Spitzer along with other members of the Shenandoah Valley Soil and Water Conservation District Board of Inspection. Dempsey Stokes and Tom Speake from the Town of Luray and William L. Blane, Jr. and John Christ from SCS accompanied the inspection team.

The following conditions were reported:

Dam No. 101 - Good condition, no extra maintenance is needed.

Dam No. 102 - Good condition, no maintenance needed.

The report is concurred by:

James E. Aleshire
James Aleshire, Director, Shenandoah Valley Soil
and Water Conservation District

Clark W. Spitzer
Clark Spitzer, Director, Shenandoah Valley Soil
and Water Conservation District

Dempsey H. Stokes
Dempsey Stokes, Town Manager of Luray, Virginia

Thomas E. Speake
Tom Speake, Town Mayor of Luray, Virginia

William L. Blane, Jr.
William L. Blane, Jr., Area Conservationist, SCS

John D. Christ
John D. Christ, District Conservationist, SCS

STAFF: Staff Office 2 days.
Area 3696.
Luray Field Office
Town of Luray
Shenandoah Valley SWCD

APPENDIX VI

REFERENCES

REFERENCES

1. Bureau of Reclamation, U.S. Department of the Interior, Design of Small Dams, A Water Resources Technical Publication, Revised Reprint, 1977.
2. Chow, Ven Te, Handbook of Applied Hydrology, McGraw - Hill Book Company, New York, 1964.
3. Chow, Ven Te, Open Channel Hydraulics, McGraw - Hill Book Company, New York, First Edition, 1959.
4. Commonwealth of Virginia, "Geologic Map of Virginia," Department of Construction and Economic Development, and Division of Mineral Resources, 1963.
5. Soil Conservation Service, "National Engineering Handbook - Section 5, Hydraulics," U.S. Department of Agriculture.
6. U.S. Army, "Inventory of United States Dams," Corps of Engineers, 9 September 1978.
7. U.S. Army, Office of the Chief of Engineers, "Appendix D, Recommended Guidelines for Safety Inspection of Dams," National Program of Inspection of Dams, Volume 1, Corps of Engineers, Washington, D.C., May 1975.
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